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MONTENEGRO
MINISTRY
OF SCIENCE

REVISED ROADMAP FOR RESEARCH INFRASTRUCTURE OF MONTENEGRO

(2019-2020)

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List of abbreviations

BIO-ICT – Centre of Excellence in Bioinformatics
CERN – European Organization for Nuclear Research
DG RTD – Directorate-General for Research and Innovation
EIT – European Institute of Innovation and Technology
EMBL – European Molecular Biology Laboratory
EMBO – European Molecular Biology Organization
ERA – European Research Area
ERAC – European Research Area and Innovation Committee
ESA – European Space Agency
ESFRI – European Strategy Forum on Research Infrastructures
ESS-ERIC – European Social Survey – European Research Infrastructure Consortium
EU – European Union
FP7 – Seventh Framework Programme for Research and Technological Development
GSI – Helmholtz Centre for Heavy Ion Research
H2020 – EU Framework Programme for Research and Innovation "Horizon 2020"
HERIC – Higher Education and Research for Innovation and Competitiveness
IAEA – International Atomic Energy Agency
ICGEB – International Centre for Genetic Engineering and Biotechnology
IA – Innovation activities
IEC – Innovation & Entrepreneurship Centre
MAP REA – Multi-annual Action Plan on a Regional Economic Area
R&D – Research and development
RCC – Regional Cooperation Council
RI Research infrastructure
SEEIIST – South East European International Institute for Sustainable Technologies
SR – Scientific Research
SRA – Scientific research activities
SRIA – Scientific research and innovative activities
STP – Science and Technology Park

INTRODUCTION

After the opening and provisional closure of Negotiation Chapter 25: Science and Research, the European Commission encouraged Montenegro to prepare and adopt a national roadmap for research infrastructure. The process of mapping the national research infrastructure ensued in 2013, when a questionnaire about scientific research equipment and availability for its sharing, drafted with expert support[1], was submitted to the institutions, eventually resulting in the "Study on Research Equipment and Creation of Joint Research Area"[2]. After that, the process of the consultations with the target groups followed, and so did the process of identifying the priorities and potential of Montenegro in terms of research infrastructure. Finally, the above results were complemented with the findings of the Study, and the first Roadmap for Research Infrastructure of Montenegro 2015-2020 was created. The document was adopted by the Council for Scientific Research Activities. At the same time, this was the first and, until recently, the only RI Roadmap in the Western Balkans region.

The Roadmap aimed to provide a comprehensive overview of the national research infrastructure, as well as to identify different sources of funding, determine the priorities and identify future potential development directions. The document itself indicates that it is not binding and that it can be amended in accordance with the new plans, goals, activities and availability of funds.

Compared to 2015, the situation has changed significantly at all levels, EU, regional and national. At the EU level, two Roadmaps of the European Strategy Forum on Research Infrastructures (ESFRI)[3], have already been replaced. These documents follow the current flows of research infrastructure policies, being closely linked to the access to available funding in this area. On the other hand, the Western Balkans region pointed to the importance of mapping and opening the regional infrastructure as one of the elements of removing obstacles to mobility of researchers[4]. However, large strategic changes and reforms in research and innovation at the national level have largely altered the previous state of play and plans. Namely, strategies of innovation and scientific research activities have been adopted, and the preparation of the Smart Specialisation Strategy – S3 (2019-2024) is in the final stage. Given that the priorities of the Smart Specialisation Strategy will become focus of all national investments, harmonisation with this strategy becomes an imperative for determining strategic directions in different segments of development of the research and innovation system. Furthermore, various instruments for financing research and innovations have been introduced into the system, such as grants for innovative and scientific research projects and financing the establishment of centres of excellence, which has contributed to the positive development trend in the field of research infrastructure. Since 2017, activities have been intensified towards internationalisation, i.e. enabling access to international knowledge centres and networking with excellent international scientific research teams. Joining the CMS experiment of the European Organization for Nuclear Research (CERN), the European Molecular Biology Organization and Laboratory (EMBO / EMBL), and the European Social Survey (ESS-ERIC) has, along with initiation of cooperation with the European Space Agency (ESA), significantly changed the perspectives in the field of internationalisation. Finally, in March 2017, the Government of Montenegro launched the initiative to establish the South East European International Institute for Sustainable Technologies (SEEI-

1 Expert support was provided within the project "Higher Education and Research for Innovation and Competitiveness" (HERIC), which is financed by a World Bank loan.
2 https://www.heric.me/en/sadrzaj/study-research-equipment-and-creation-joint-research-area
3 https://www.esfri.eu/esfri-roadmap
4 https://www.rcc.int/docs/383/multi-annual-action-plan-for-a-regional-economic-area-in-the-western-balkans-six

IST)[5], which has obtained the status of a regional project in October the same year, following the signing of the Declaration of Intent[6] at CERN. The project received the first financial support from the Directorate-General for Research and Innovation of the European Commission (DG RTD). Currently, the preparations for a Call "Design Studies" within the EU Framework Programme for Research and Innovation H2020 are underway, and the next step will be to preparation of the application for ESFRI Roadmap, as one of the most ambitious and difficult tasks to date. One of the requirements for applying for ESFRI Roadmap is to have the project included in a national RI roadmap of at least one participant. During the current SEEIIST Design Study Phase, support was provided by CERN and GSI Darmstadt Institute, which will host the project until the location of the Institute is determined. This means that the highest-level expertise has been obtained, which provides excellent chances for the success of the project. Hence, SEEIIST is the first project from this region to have the potential to be included in the ESFRI Roadmap.

Due to the aforementioned, the need has arisen to amend the existing National RI Roadmap, with several reasons existing for the revised version to be drafted for a two-year period. First of all, the goal is to determine the current state of play and to analyse the progress achieved so far in order to adequately prepare for the next six-year planning period (2021-2026). In addition, with a view to better determine future development directions, it is necessary to include the instruments that have emerged in the meantime, as well as to identify the effects of infrastructures that were at initial stages of development back in 2015. The most important development in this regard is certainly the adoption of the Smart Specialisation Strategy (2019-2024) and the accompanying Action Plan, which is yet to follow, in order to include and reflect all the projects and activities in this document in the best possible manner.

Given the above reasons, the goals of the Revised Roadmap for Research Infrastructure of Montenegro (2019-2020) are the following:

- Providing a detailed overview of research infrastructure in Montenegro and the needs for further development;
- Defining priorities and sources of financing; and
- The potential and future directions of development of research infrastructure in Montenegro.

The document is not binding, but it constitutes a basis for planning national research and innovation instruments for the period of 2019-2020 and supports the development in line with EU priorities in the field of research infrastructure, with special reference to the ESFRI Roadmap (2018).

5 http://seeiist.eu/
6 http://seeiist.com/wp-content/uploads/2018/05/DOI_SouthEastEuropeanInst_25102017.pdf

I NATIONAL RESEARCH INFRASTRUCTURE OVERVIEW, STATE OF PLAY AND PRIORITIES

I.1 What is research infrastructure?

The definition of "research infrastructure" used throughout this document was harmonized with and taken over from the EU Framework Programme for Research and Innovation "Horizon 2020" (2014-2020)[7].

Regulation 1291/2013 defines research infrastructures as facilities, resources and services that are used by the research communities to conduct research and foster innovation in their fields. According to the Regulation, where relevant, these may be used beyond research, e.g. for education or public services. Research infrastructures include major scientific equipment or sets of instruments; knowledge-based resources such as collections, archives or scientific data; e-infrastructures, such as data and computing systems and communication networks; and any other infrastructure of a unique nature essential to achieve excellence in research and innovation. Such infrastructures may be 'single-sited', 'virtual' or 'distributed'.[8]

In terms of classifying the research infrastructures based on their size, there is no single definition, which is why the following classification will be used for needs of this document:

- Large research infrastructures: research infrastructures in which it is possible to perform all the research activities during a research process in a given scientific research area, which, at the same time, operate as independent units with their own administrative structure;
- Medium-sized research infrastructures: research infrastructures enabling the implementation of one or more phases of a research process or (for example, in the case of regional centres) constituting a part of a large research infrastructure;
- Small research infrastructures: research infrastructures enabling the implementation of individual tasks within a research process and providing support during the implementation of those tasks.

The research infrastructure plays a key role in the scientific research and innovation system. The existence of research infrastructure is one of the basic requirements for improving the knowledge base, strengthening research capacities, improving the development of all science disciplines and accelerating the dynamism of technological progress. Competitive research infrastructures bring together excellent researchers and scientific research teams, strength-

7 Article 2, Paragraph 6 of Regulation (EU) No 1291/2013 of the European Parliament and of the Council of 11 December 2013 establishing Horizon 2020 – the Framework Programme for Research and Innovation (2014-2020) and repealing Decision No 1982/2006/EC (CELEX 32013R1291)
https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32013R1291

8 Examples of infrastructures per type: single-sited – EST, European Solar Telescope (http://www.est-east.eu/est/index.php), distributed – ELI, Extreme Light Infrastructure (http://www.eli-laser.eu), virtual – DARIAH-EU, Digital Research Infrastructure for the Arts and Humanities (https://www.dariah.eu/).

en their mutual cooperation, improve the development of certain research areas, address the economic and social challenges, stimulate innovation, open up for knowledge sharing with the business sector and the public, attract foreign researchers and other users, and attract foreign investments. All this significantly contributes to strengthening the competitiveness of a country at the international level.

In terms of research infrastructure and technological development, the Western Balkans region went through a period of strong stagnation that began in the 1990s. A positive development trend has therefore been present only in recent years, thanks to the reform of national research systems and the opening up to the international scientific research community, as well as the activities undertaken on the path of integration into European Research Area (ERA). On this path, the first step to take is at the national level, where it is necessary to identify research infrastructures of strategic importance for development of the country, i.e. infrastructures with potential to enable excellent research, encourage interdisciplinarity and foster service-oriented access ("user-access"). In this regard, it is also necessary to plan the available resources for this purpose in a smart way. On the other hand, the shortcomings at the national level should be compensated by a wide range of opportunities arising from regional and international cooperation. The Western Balkans region, as well as South East Europe, shares the same challenges and largely the same research priorities. Because of this, ensuring transparency of information on the possibilities of cooperation within different regional research infrastructures and the strengthening of regional cooperation can significantly contribute to resource-saving and facilitated implementation of certain tasks in the research process. Finally, access to renowned international infrastructures and cooperation with international research teams contribute to strengthening research capacities and encourage the initiatives for transfer of knowledge and technology into the national context.

This Roadmap is dedicated specifically to identifying national research infrastructures with a great potential to have an impact on the strategic development directions of Montenegro, as well as to the initiatives in the field of regional and international cooperation, which can significantly improve the positioning of Montenegro in the European Research Area.

I.2 The research infrastructure mapping process

RI mapping is an instrument for identification and categorisation of existing and planned research infrastructure. The process includes all segments of the society: decision-makers, researchers, representatives of the business and the civil sector and other interested public, in accordance with the quadruple helix[9] model. In the majority of cases, the RI mapping methodology includes comprehensive questionnaires / interviews, which are used to collect a whole range of information. The analysis of data obtained in this manner enables optimisation of the use of existing infrastructure, more rational use and future development of planned research infrastructures, presenting, at the same time, a significant source of data for decision-makers, who are provided with an overview and insight into the condition of the research infrastructure, which enables them to plan future investments and strategic directions towards international research infrastructures. The process of RI mapping takes up a special place in the context of drafting smart specialisation strategies as well, as it forms part of a broader analysis of research potential, indicating the ways in which major national infrastructures can strengthen

9 A new approach to the adoption of public policies through comprehensive consultation and cooperation between the government, academic / research community, economic and the civil sector.

research and innovation as key elements of regional development.
Montenegro was the first country in the Western Balkans to conduct the RI mapping process. Namely, in cooperation with an expert, within the "Higher Education and Research for Innovation and Competitiveness" (HERIC) project, financed by a World Bank loan, the Ministry of Science drafted a mapping questionnaire in 2013. The questionnaire related to the existing research infrastructure, including data such as location, type of infrastructure, scientific area to which it belongs, maintenance, number of users, etc., as well as the missing / planned research infrastructure. A separate segment of the questionnaire inquired about the readiness of institutions to share the equipment. The results of the process were consolidated in the "Study on Research Equipment and Creation of Joint Research Area"[10] (2013). The Study provides an overview of the capital and mid-level equipment of scientific research institutions in Montenegro, indicating the good condition of the existing infrastructure capacities. On the other hand, the Study has shown that the national research infrastructure is rather fragmented and isolated, with equipment duplication present as well. Finally, recommendations have been given for defining a cooperation model that implies the joint use of infrastructure capacities (space and equipment, including relevant knowledge and resources) with a view to optimal and efficient use of the existing infrastructure and planning of the procurement of new equipment. In order to implement the findings of the Study, the obligation to cooperate with local scientific research institutions and the careful planning of equipment procurement have become the main requirements for granting the national funds to research and development projects. Furthermore, "Scientific Network"[11] has been established as an online platform and a "virtual node" for data on scientific research institutions.
The need to amend the National RI Roadmap led to the launch of a new cycle of research infrastructure mapping in the first half of 2019. Once again, the process was carried out with the expert support provided within the HERIC project. Two questionnaires were prepared:

- A questionnaire for institutions, as a simplified version of the previous one, containing all the necessary information about the medium and capital equipment (type, scientific area, location, short description, number of users, maintenance), as well as the questions related to equipment sharing, open access and services that can be offered by certain infrastructures; and
- A questionnaire for the interested public, referring to preferences in terms of access to national, regional and large European research infrastructure, published on the website of the Ministry and distributed through academic and other mailing lists[12].

During the mapping process, consultations with the interested public were carried out within the Information Session on Research Infrastructure in the Danube Macro-Region[13], held on 17 April 2019, as well as within the meeting with the interested public[14], held on 25 April 2019.
The Ministry of Science has prepared a list of 37 institutions to which the questionnaire was sent, and these are the institutions included in the Registry of Licensed Scientific Research Institutions and the Registry of Innovative Organisations of the Ministry. The completed questionnaire was timely submitted by 36 institutions – 2 from Niksic, 2 from Bar, 2 from Kotor, 1 from Igalo, 1 from Berane, and others from Podgorica. The results of the RI mapping process will be integrated in the Study, currently under preparation, aiming at establishing a competi-

10 https://www.heric.me/sadrzaj/studija-o-naucnoistrazivackoj-opremi-i-formiranju-zajednickog-istrazivackog-prostora
11 http://www.naucnamreza.me/
12 http://www.mna.gov.me/vijesti/198611/Poziva-se-zainteresovana-javnost-da-ucestvuje-u-aktuelnom-procesu-mapiranja-istrazivacke-infrastrukture.html
13 http://www.mna.gov.me/vijesti/198612/Odrzana-Informativna-sesija-o-istrazivackoj-infrastrukturi-u-Dunavskom-makro-regionu-u-okviru-ResInfra-DR-projekta.html
14 http://www.mna.gov.me/vijesti/198832/Odrzane-konsultacije-za-zainteresovanu-javnost-Mapiranje-istrazivacke-infrastrukture.html

tive research environment and creating common research resources, especially in the field of equipment and capital resources utilization. The Study presents an update and revision of the previous Study from 2013, through updating data related to existing equipment and resources, as well as the stated needs for the new equipment. The Study contains two parts - the first part refers to the determination of the basic research capacity that exists (equipment worth more than EUR 5,000) and support for the creation of a system of shared use of equipment, in order to avoid duplicate equipment financing during the implementation of the research and innovation grant programmes, while the second part is dedicated to examining the needs of the mapped institutions for new research equipment (equipment of medium and capital value, more than EUR 5,000). In addition, the needs and preferences for access to a domestic, regional and competitive European research infrastructure were analysed. One of the goals was also to introduce to the scientific research institutions, business sector and general public with the already provided access to research infrastructures.
The new mapping process has resulted in an overview of the current research infrastructure state of play, and is an important element in the process of preparing the Smart Specialisation Strategy and the basis for the preparation of future activities of the instruments in this field[15].

I.3 Analysis of the state of play

In the EU integration process, the main goal is to better position the countries in the European Research Area (ERA). The ERA represents a single framework of cooperation in research and innovation in the EU, in which the smooth flow of knowledge, researchers and technologies is enabled. In the context of research infrastructure, two ERA priorities are particularly important:

- optimal transnational cooperation and competition, including research infrastructures; and
- optimal circulation, access to and transfer of scientific knowledge including knowledge circulation and open access.

Montenegro has adopted the National Roadmap for European Research Area (ERA) in 2016, as a policy document that determines the way in which the activities within the identified ERA priorities will be implemented. In the area of research infrastructure, this document identifies the following key activities: optimising and efficient use of available sources of financing, continuous monitoring of activities at the EU level and creation of a virtual infrastructure node.
Montenegro has the status of an observer and takes active part in the work of the European Research Area and Innovation Committee (ERAC), one of the most important ERA bodies, following its conclusions and, where applicable, including them in the policy research and innovation documents. The country also actively participates in the work of another ERA body, which represents the most important strategic instrument for the field of research infrastructure at the EU level – ESFRI[16], in order to better integrate into the ERA and to strengthen the potential for using the pan-European research infrastructure. For many years, ESFRI has encouraged both the Member States and the associated countries to adopt national Roadmaps that will be connected to the European one, in order to provide for the scientific integration of Europe and to strengthen its international reach. By participating in ESFRI, Montenegro is given an opportunity to become more familiar with the strategic approach to research infrastructure in Europe, the major initiatives, the role and development of the most important research infrastructures, and various multilateral initiatives aimed at optimisation of the use of infrastructure and strengthening cooperation, which is a very important starting ground when planning the national research infrastructure development directions.

15 Results of the RI mapping process 2019 are integral part of the Analysis of the state of play
16 https://www.esfri.eu/

At the regional level, guidelines in the field of RI development are contained in the Multi-annual Action Plan on a Regional Economic Area (MAP REA)[17], adopted by the Prime Ministers of the Western Balkans Six on 12 July 2017 in Trieste. One of the priority actions defined within the "Mobility" pillar, as part of the "Mobility of Researchers" policy, i.e. the "Removal of obstacles to mobility of researchers" objective, is: "Map existing research infrastructure in the region to ensure transparent and available information to researchers interested to cooperate with and in the Western Balkans and to identify gaps". Regional Cooperation Council (RCC) provides support in the implementation of this activity. So far, two workshops have been held on the topics of RI mapping and access to regional RI, as follows: on 30 October 2018 in Sarajevo[18], and on 8 April 2019 in Ulcinj[19]. The leaders of the Western Balkans Six have agreed to work on improving the regional infrastructure jointly, and have discussed the concept of a regional research infrastructure database, which would significantly improve the transparency, availability and exchange of information in the region. The 2019 RI mapping process in Montenegro, inter alia, contributes to the implementation of this objective within the MAP REA, as it provides an overview of the research infrastructure in Montenegro, noting the public interest in using the regional infrastructure.

Research infrastructure is in the focus of all the umbrella policy documents of Montenegro:

- The Mid-term Programme of Work of the Government, where the focus is placed on large and strategically important infrastructures (STP and SEEIIST);
- Montenegro Development Directions 2018-2021[20], in the Smart Growth section, "Science" field; and
- Economic Reform Programme 2019-2021[21], as part of the "Strengthening National Innovation Ecosystem" measure.

Infrastructure is also recognised in the national sectoral research and innovation policy documents. Improving the infrastructure for support to innovation and technological development is one of the priorities of the Strategy of Innovation Activities (2016-2020)22, where, in the context of the contribution to development of all scientific disciplines and the strengthening of human resources, all the most important infrastructures are identified, such as centres of excellence, science and technology parks, technology transfer centres and infrastructures for support to the development of intellectual property. The Strategy of Scientific Research Activities (2017-2021), in addition to focusing on the development of the most important national research infrastructures, pays special attention to access to modern technologies and large research infrastructures, the establishment of collaborations with renowned international scientific research teams, and providing for availability of national research infrastructures.
The Montenegrin Roadmap for Research Infrastructure 2015-2020[23] has identified the crucial problem in fragmentation, poor transparency and inadequate use of research infrastructure, defining the following priority activities: strengthening visibility and promoting the existing research infrastructures, creating rules for joint use and sharing research infrastructure, and

17 https://www.rcc.int/docs/383/consolidated-multi-annual-action-plan-for-a-regional-economic-area-in-the-western-balkans-six
18 http://www.mna.gov.me/vijesti/193176/Zapadni-Balkan-slozio-se-da-unaprijedi-istrazivacku-infrastrukturu.html
19 http://www.mna.gov.me/vijesti/198170/Ulcinj-je-danas-bio-domacin-radionice-na-temu-mapiranja-naucnoistrazivacke-infrastrukture-u-organizaciji-Savjeta-za-regionalnu-s.html
20 http://www.gov.me/naslovna/vijesti-iz-ministarstava/181413/Pravci-razvoja-Crne-Gore-2018-2021-godine.html
21 http://www.gov.me/naslovna/Program_ekonomskih_reformi_Crne_Gore/
22 http://www.mna.gov.me/biblioteka/strategije
23 https://www.esfri.eu/national-roadmaps

establishing a virtual node for research infrastructure. By 2019, excellent results have been achieved in the context of strengthening the visibility of the existing research infrastructures, with Scientific Network established as an online platform for researchers and licensed scientific research institutions and innovative organisations, while the obligation of domestic scientific research institutions to cooperate among themselves and with economic and other entities, as well as detailed planning of equipment procurement, have become some of the main requirements for allocation of funds through research and innovation support instruments. The goal that has not been fulfilled in the previous period was to include an overview of the available equipment in the "Scientific Network"; however, within HERIC project, expert support has been provided in early 2019, and the preparations are underway for system improvement. This way, the system will include equipment data obtained during the mapping process, which will significantly improve the possibility of connecting to some of the larger research infrastructure databases. It has also turned out that additional interventions are needed to create the rules for joint use of equipment, primarily in terms of awareness raising and reaching consensual solutions.

Currently, there are 46 institutions in the Registry of Licensed Scientific Research Institutions: 25 faculties, 3 institutes, 6 business entities, 1 agency, 4 offices, 4 other public institutions and 3 NGOs (Figure 1 and Figure 2).

Licensed scientific research institutions - STRUCTURE

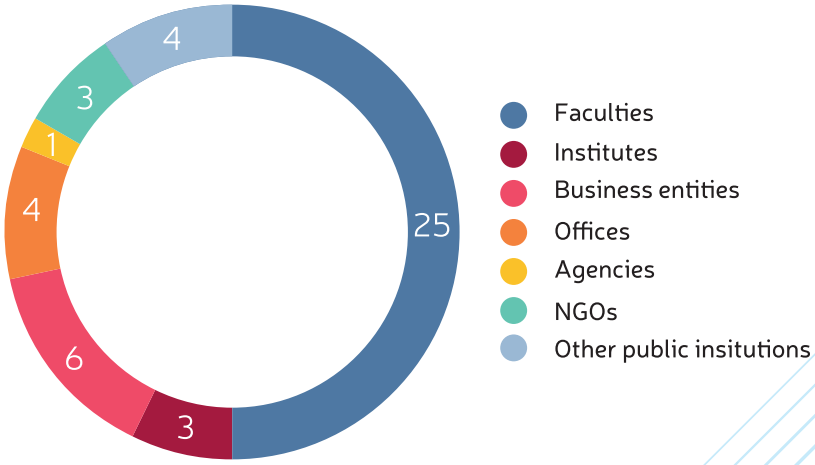


Figure 1. *Structure of licensed scientific research institutions*

Structure of licensed scientific research institutions per science field

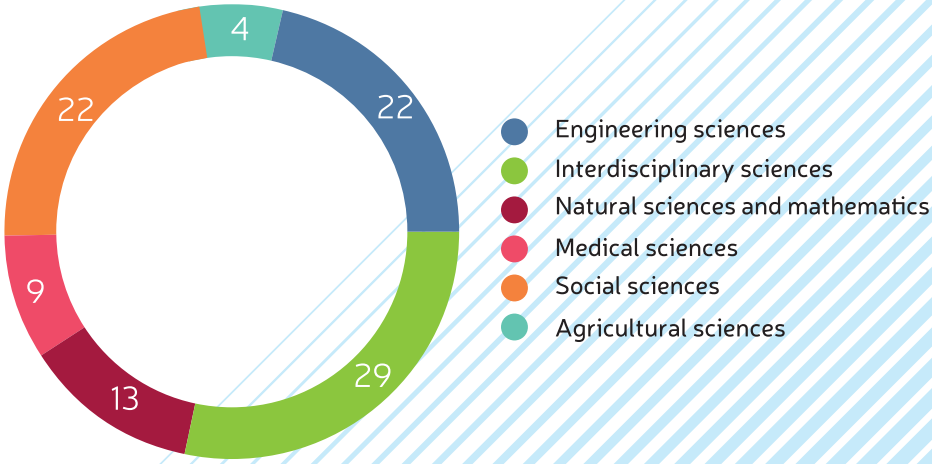


Figure 2. *Structure of licensed scientific research institutions per science field*

In the Registry of Innovative Organisations, there are 33 organisations, as follows: 13 scientific research institutions, 18 business entities, 1 innovation & entrepreneurship centre, and 1 centre of excellence (Figure 3).

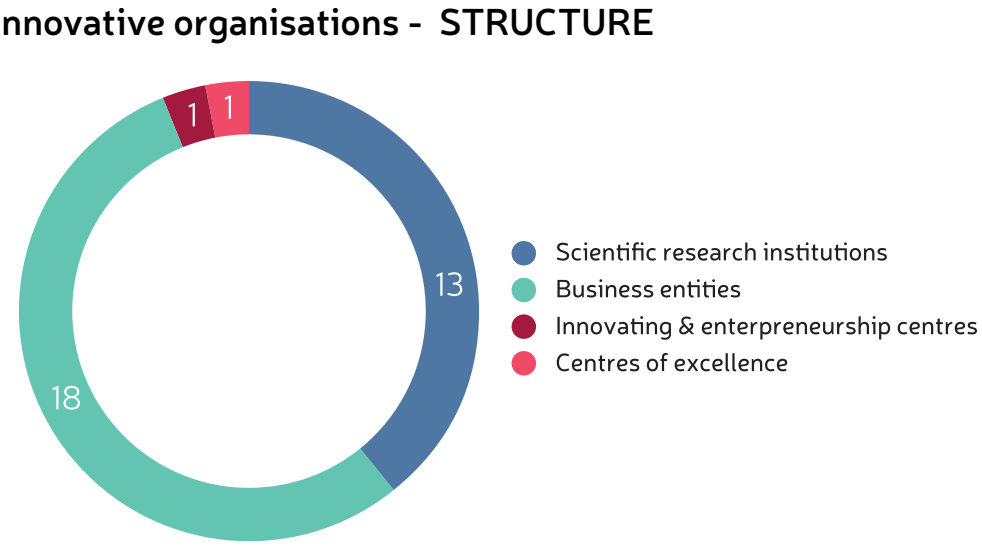


Figure 3. *Structure of innovative organisations in the Registry of Innovative Organisations of the Ministry of Science*

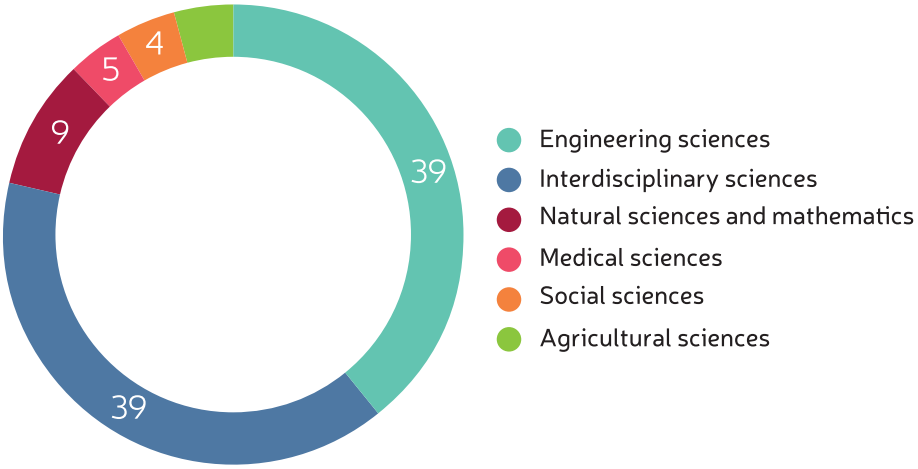


Figure 4. *Structure of innovative organisations per field*

One of the main requirements for registration in the aforementioned registries of the Ministry of Science is the possession of adequate scientific research equipment.

According to the latest official statistics on R&D from 2016[24], there were 1509 researchers engaged in scientific research activities that year. Based on the structure of researchers, it is noticeable that most researchers are active in social sciences and humanities, followed by engineering sciences, natural sciences, medical and, finally, agricultural sciences.

Structure of research per science field

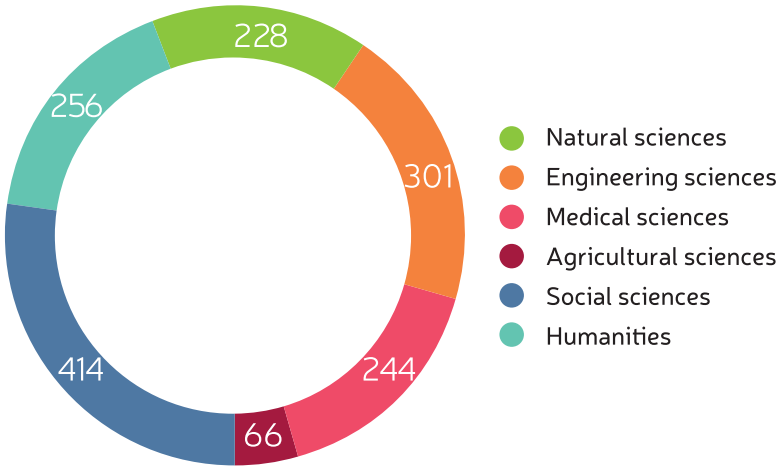


Figure 5. *Structure of researchers per science field*

Although Montenegro has a relatively small number of researchers, and even though it is necessary to undertake a series of measures to strengthen research capacities, it is noticeable that their concentration is the greatest in areas that are recognised as priorities for development of Montenegro (see section I.4 – National priorities).
As for the research and innovation financial instruments that have contributed to the development of research infrastructure ever since 2015, the most important are the following:

> ***Grants for R&D subprojects*** are a special instrument financed within the HERIC project. The programme was aimed to: encourage applied and developmental scientific research, creating the potential for competitiveness at the international level; support the development of innovations, patents, commercial and other scientific results; and strengthen the quality and sustainable partnerships that show the potential to integrate research into the dominant economic drivers of Montenegro and to grow into future centres of excellence. In addition, the programme included the modernisation of laboratory equipment for the needs of high-quality scientific and applied research and development, i.e. it supported the development of new and improvement of existing research infrastructure. The programme was implemented under two calls[25], with a total of 8 projects approved in the total amount of EUR 2.6 million. All eight projects were successfully implemented (more details on the results of the projects are provided in section I.5 Overview of research infrastructure). The involved scientific research institutions enhanced their research potential and laboratory equipment, and were prepared for future activities aimed at strengthening scientific excellence.

24 http://www.mna.gov.me/rubrike/Statistika_istrazivanja_i_razvoja/189772/Objavljeni-finalni-podaci-o-statistici-istrazivanja-i-razvoja-za-2016-godinu.html
25 The First Call: https://www.heric.me/pozivi-za-grantove/konkurs-za-dodjelu-grantova-za-potprojekte-istrazivanja-i-razvoja and the Second Call: https://www.heric.me/konkurs-pozivi-za-grantove/drugi-poziv-za-dostavljanje-prijava-za-potprojekte-istrazivanja-i-razvoja

Grants for Innovative Projects[26] are a new instrument of the Ministry of Science, introduced into the system in 2018. The instrument is implemented in accordance with the Programme of Grants for Innovative Projects (2018-2020), while the preparation of the next programme is underway. The key objectives of the programme are related to: strengthening the competitiveness of Montenegrin companies by co-financing the development of innovative market-oriented products, services and technologies with great potential for commercialisation and market application; supporting the transfer of innovative ideas from scientific research institutions to the market through cooperation with the business partners or the opening of new enterprises / spin-off companies in Montenegro; and strengthening human resources and creating new jobs. The allocation for the 2018-2020 Programme amounts to EUR 1 million. On the basis of the Call for Applications, 10 grants have been awarded for innovative projects in the total amount of EUR 1,172,529, of which the Ministry of Science co-finances EUR 730,834, while the co-financing of the grant proponents amounts to EUR 441,695. The instrument provides specific support to the research infrastructure, because the programme has determined that the purchase of necessary equipment is an eligible cost, as well as that up to 50% of the grant funds can be planned for these purposes. The innovative projects provide for equipment investments in the total amount of EUR 187,750, of which EUR 126,805 from the funds of the Ministry. As part of the projects, one of the most important results in terms of infrastructure is the planned establishment of a new laboratory (Laboratory for Food Quality and Safety), as well as that of a centre (EUREF Permanent Network – EPN Station) and that of an institute (Water Institute), while the rest of the equipment is envisaged for the improvement of existing infrastructure capacities.

Grants for Scientific Research Projects[27] are a special instrument of support to scientific teams and scientific research institutions in Montenegro, aimed at strengthening quality and sustainable partnerships that show the potential to integrate research into the dominant economic drivers in Montenegro and grow into future centres of excellence. The programme supports the research focused on scientific excellence in all types of research, including the basic one, which will be recognisable at the international level, in order for Montenegro to become a preferred environment for top scientists from abroad (including those from the diaspora). The total grant fund amounts to EUR 1 million. The Ministry of Science has awarded 15 grants in the total amount of approx. EUR 1.3 million. Procurement of scientific research equipment is one of the eligible costs, and has been approved for 13 projects, while the total planned amount of grant funds for these purposes amounts to EUR 141,169.70. Procurement of equipment within these projects is planned primarily for the improvement of existing research infrastructure.

26 http://www.mna.gov.me/vijesti/189068/Ministarstvo-nauke-objavljuje-Konkurs-za-dodjelu-grantova-za-inovativne-projekte.html
27 http://www.mna.gov.me/ministarstvo/Otvoreni_pozivi/Otvoreni_pozivi/193061/Milion-eura-za-naucnoistrazivacke-projekte.html

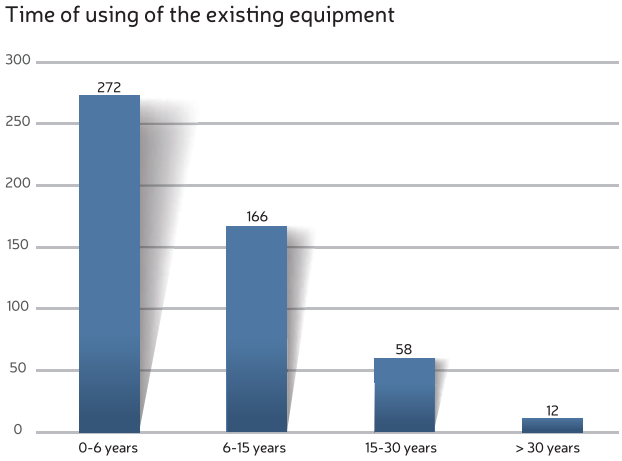
The state budget for science for 2018 was increased by 60% compared to 2017, as well as by additional 10% in 2019, which enabled the implementation of the above-mentioned new financing instruments. Most of these instruments are based on the principle of co-financing, i.e. the contribution of users of these instruments through their own financial participation, with a focus on the private sector, which is why the leverage effect in terms of the funds from the business sector is expected in the coming period, along with a more significant impact on the total research and innovation consumption in the country. The focus was primarily on **strengthening the instruments of financial support for research and innovation** through grant schemes for innovative and scientific research projects and the programme of centres of excellence aimed at stimulating cooperation between scientific research institutions and the business sector, encouraging investment by grant beneficiaries, and fostering excellence.

According to the latest official data, total domestic spending on research and development in Montenegro in 2016 amounted to 0.32% of GDP, which is well below the EU average. Investments in research infrastructures often require large resources, and given the low level of investment in research and development and the need to finance various reform activities in the research and innovation system that are primarily focused on stimulating investment by the private sector, as well as on support for the withdrawal of resources from the relevant EU funds, the available funding for research infrastructure should be utilised in an optimal manner. This implies avoiding duplication of financing for individual research infrastructures and stimulating the sharing of equipment and enabling access to existing research infrastructure.

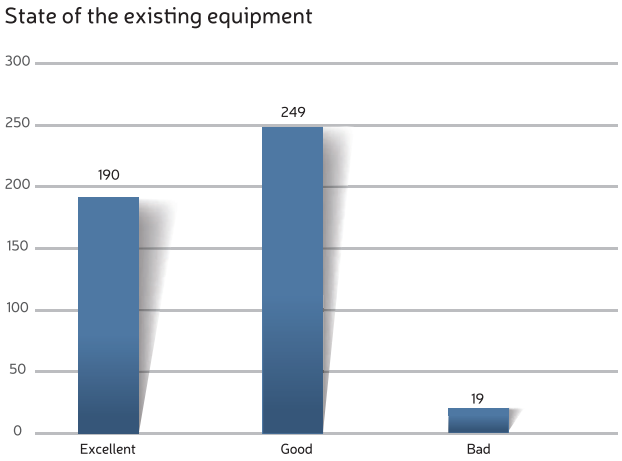
The results of the mapping process have indicated the good condition of the existing research equipment, as well as the high degree of readiness of institutions to share equipment, as well as to provide access to research equipment. However, the issue of duplication of certain scientific research equipment is still visible, but on smaller scale compared to 2013, as well as the problem of fragmentation of research infrastructure.[28]

28 Study will be published by the end of June 2019.

An overview of the use of existing equipment and condition of equipment is shown on the pictures below (Picture 6 i Picture 7).



Picture 6.
Comparative diagrams of time of using the existing equipment in the institutions (capital and medium value equipment). The numbers above the histogram show the number of pieces of equipment in the given category.



Picture 7.
Comparative diagrams of the current state of existing equipment in the institutions (capital and medium value equipment). The numbers above the histogram show the number of pieces of equipment in the given category.

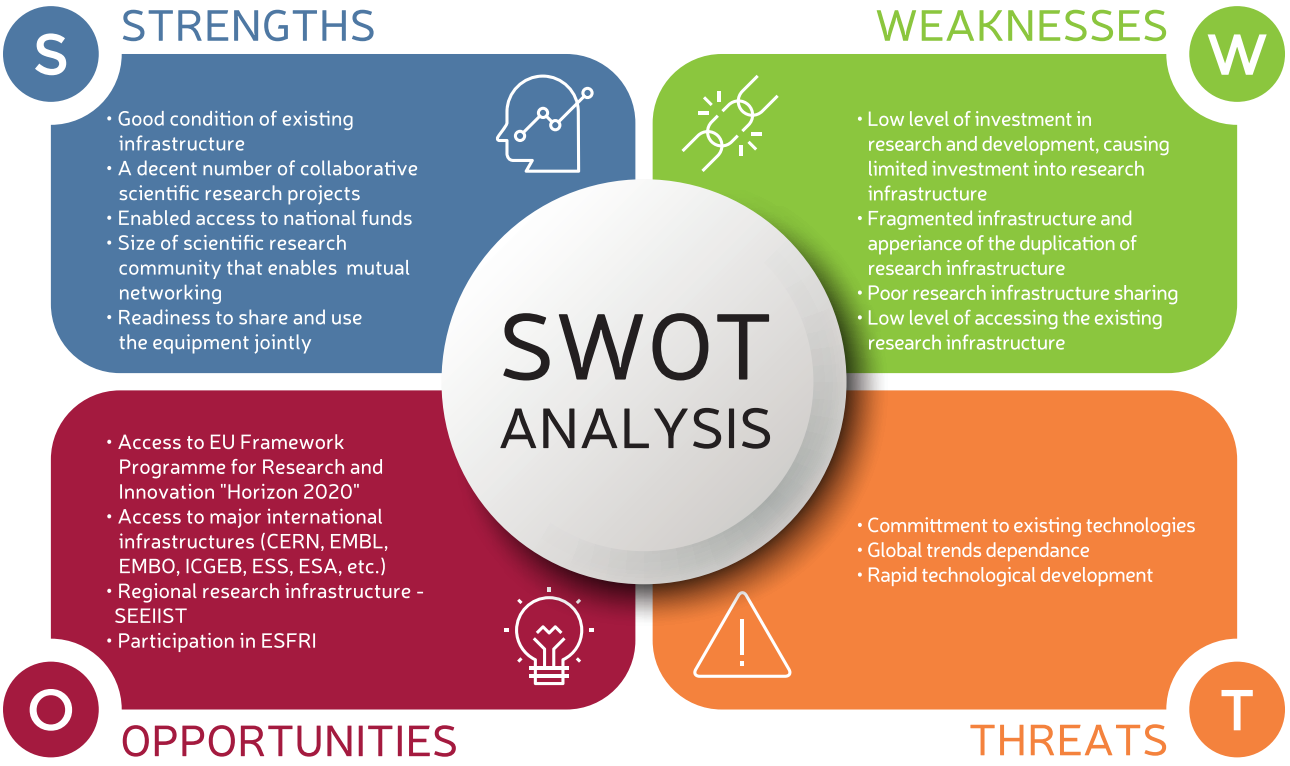
The Study showed that the existing equipment at the mapped institutions has a total value of cca. MEUR 28, as shown in Table 1. According to the value of the existing equipment, the Clinical Center of Montenegro (the value of existing equipment of about MEUR 11) and the Institute for Black Metallurgy Niksic (value of the existing equipment is about MEUR 3,5) stand out. **The value of equipment purchased in the last 6 years amounts to cca. MEUR 18,6, which is about 67% of the total value of the existing equipment at all institutions that participated in this study.** According to the value of the equipment purchased in the last 6 years, the Clinical Center of Montenegro (cca. MEUR 11 for completely new equipment) and the Maritime Faculty - University of Montenegro in Kotor (the value of the new existing equipment of MEUR 1,53) are on the top of the list.

Table 1:
Total value of the capital and medium equipment (> EUR 5,000) on the 36 institutions in Montenegro which participated in the 2019 RI mapping process

Existing equipment (EUR)		
	Value	Other costs*
Price of the equipment (EUR)	27.820.408,00	2.391.600,00
Total	**27.820.408,00**	**2.391.600,00**
TOTAL	**27.820.408,00**	

In terms of research areas according to the existing capital equipment and equipment of medium value, technical and technological sciences are the most represented (44%), followed by multidisciplinary (33%) and natural-mathematical sciences (10%). Multidisciplinary areas covered by institutions can be grouped into the following four general multidisciplinary areas:

- Technical-technological sciences, natural-mathematical sciences, medical sciences, biotechnology, agricultural science;
- Ecotoxicological research, medical sciences, biotechnology, agricultural sciences, natural-mathematical sciences;
- Information technology, computer networks, software engineering, intelligent systems, entrepreneurship; and
- Tourism, hotel management.



I.4 National priorities

National priorities relevant to the area of research infrastructure are identified by several policy documents, including, as the most important ones, the following:

- Montenegro Development Directions 2018-2021;
- Strategy of Innovation Activities (2016-2020);
- Strategy of Scientific Research Activities (2017-2021); and
- Guidelines for the Smart Specialisation Strategy.

Montenegro Development Directions 2018-2021 make up one of the national umbrella policy documents and define four priority development sectors:

- ***Tourism;***
- ***Energy;***
- ***Agriculture and rural development; and***
- ***Manufacturing industry.***

One of the key development directions is smart growth, where science is identified as one of the priorities that can contribute to advancement of strategic development directions of the state.

The Strategy of Innovation Activities (2016-2020) defines six priorities, as follows:

- ***Energy;***
- ***Agriculture and food;***
- ***Sustainable development and tourism;***
- ***Information and communication technologies;***
- ***Medicine and health of people; and***
- ***New materials, products and services.***

Priority investments in innovations in the past period, which implied investment into research infrastructure as well, have been harmonised with the priorities identified by this Strategy.

Strategy of Scientific Research Activities (2017-2021) defines ***seven priorities that, in addition to the ones defined in the Strategy of Innovation Activities, encompass "science, education and identity"***, and which have been designated as the pathway to identification of smart specialisation priorities.

Finally, the priorities proposed by the Draft Smart Specialisation Strategy are:

- ***Sustainable agriculture and food value chain;***
- ***Energy and sustainable environment;***
- ***Sustainable and health tourism; and***
- ***Information and communication technologies as a horizontal priority.***

Vertical priority: Sustainable agriculture and food value chain

Agriculture is a sector that plays a multiple role in the development of Montenegrin society and economy. Its economic significance is reflected in the high GDP contribution and an even greater percentage of employed labour force in the sector in relation to total employment in Montenegro. Furthermore, agriculture plays an important role in the entire food chain (food industry and related sectors), contributes to the development of tourism, etc. The analysis of the economic, research and innovation potential of Montenegro, which was undertaken within the process of drafting the Smart Specialisation Strategy and presented in the Guidelines for the Smart Specialisation Strategy, establishes that agriculture has an identified research potential (Scimago, H2020), as well as that it is one of the leading areas of Montenegro in terms of innovation potential and that it is an area of economic specialisation.

Vertical priority: Energy and sustainable environment

Montenegro strives to become a regional energy hub with a high degree of use of energy sources and secondary technical raw materials based on the principles of circular economy and sustainable environment. The main objective of the energy sector in Montenegro is to increase the share of use of energy from renewable sources, with a focus on the sustainable development of the sector. Based on the analysis of the economic, research and innovation potential of Montenegro, energy also has an identified research potential (Scimago, H2020), it is one of the leading areas of Montenegro in terms of innovation potential and is an area of economic specialisation.

Vertical priority: Sustainable and health tourism

Cooperation in the sectors of tourism and health in Montenegro provides a synergistic effect that can lead to the improvement of health tourism, as well as of the tourist offer. The geographical position of the country, numerous natural attractions, the abundance of natural resources, cultural heritage, as well as a wide range of healthcare services offered, open the possibility for Montenegro to become one of the most attractive destinations in the world.

Horizontal priority: Information and communication technologies (ICT)

ICT is present in all other priority areas and in all economic and social aspects of life, with great growth potential. ICT is developing in the context of improvement of information systems in public administration, education, industry and healthcare, in line with modern technological trends and the concept of Industry 4.0.

As the Smart Specialisation Strategy becomes the priority of all national investments, but is also relevant for different EU funds, the future investments and directions for research infrastructure will primarily relate to the identified priority strategic development areas in this document.

I.5 Research infrastructure overview

IMPLEMENTATION OF "HIGHER EDUCATION AND RESEARCH FOR INNOVATION AND COMPETITIVENESS" PROJECT – (HERIC) AND CONTRIBUTION TO RESEARCH INFRASTRUCTURE

Through the Ministry of Science and the Ministry of Education, using the loan funds received from the World Bank **in the amount of EUR 12 million**, the Government of Montenegro implements the HERIC project for a period of seven years, **from 2012 to 2019**.

The HERIC project supports initiatives that enable innovations to become a pillar for developing a dynamic and relevant environment for the development of science and research, providing scientific institutions and public and private companies with the opportunity to play a more active role in research and development and enabling technology transfer. The development goal of the project is to strengthen the quality and importance of the research in Montenegro.

The main objective of the HERIC project is "to strengthen the quality and relevance of higher education and research in Montenegro by reforming the higher education finance and quality assurance systems and by strengthening research and development capabilities."

Within the third component of the HERIC project, "Establishing a Competitive Research Environment", inter alia, the establishment and operation of the first pilot centre of excellence in Montenegro, Centre of Excellence in Bioinformatics – BIO-ICT, was financed.

CENTRE OF EXCELLENCE IN BIOINFORMATICS (BIO-ICT)[29]

Project implementation period: 1 June 2014 – 31 March 2019
Grant amount: EUR 3,235,000

The main objective of the BIO-ICT project is to increase the application and use of state-of-the-art ICT technologies in the areas of sustainable agriculture, monitoring of the crops, forest and water/sea ecosystem, development of techniques for controlling and reducing air pollution, analysis and standardisation of food products, control of land quality, and improvement in the public health area.
These activities are based on the principle of collecting various types of data, their storage and processing with a view to giving recommendations to producers (starting with two business partners) and other end users, all with the aim of improving production. Activities are divided into two scientific domains: **the application of ICT in agriculture and the application of ICT in biomonitoring**.

The consortium is composed of the following project partners:

- Faculty of Electrical Engineering, University of Montenegro, national scientific research institution, project coordinator;
- Biotechnical Faculty, University of Montenegro, national scientific research institution, project partner;
- Institute for Marine Biology, University of Montenegro, national scientific research institution, project partner;
- Institute of Public Health, national scientific research institution, project partner;
- Centre for TeleInFrastruktur, Aalborg University, Denmark, international scientific research institution, project partner;
- St. Petersburg Scientific Research Centre for Ecological Safety, Russian Academy of Sciences, international scientific research institution, project partner;
- "Green House Jovović", national company (LLC), project partner; and
- "Cogi" from Kotor, national company (LLC), project partner.

Interdisciplinary research is conducted in the areas of ICT; Agriculture and food; Medicine and health of people; and Sustainable development and tourism. In the project implementation, a total of 88 researchers have been engaged from different scientific fields, including 15 young researchers – doctoral students and 5 postdoctoral students.

During the implementation of the BIO-ICT project, four completely new laboratories were adapted and equipped, while 10 existing laboratories were significantly improved. In addition, two testing grounds of the business partners were equipped and made functional. In financial terms, about EUR 1.2 million were invested in new research equipment (BIO-ICT laboratory at the Faculty of Electrical Engineering and the "wet" laboratory at the Institute for Marine Biology). ICT infrastructure in the Information System Centre (UCG-CIS) for the needs of the BIO-ICT Data Centre was significantly improved.

29 www.bio-ict.ac.me

Several innovative products and systems for support to different users were developed: LiveGate IoT platform (www.livegate.ac.me), SEMaR (Smart buoy system); BioPortal, SharpEye, etc.

Based on the business plan and sustainability study prepared by the German company Detecon, the most adequate organisational form of the BIO-ICT as a sustainable structure was identified in the model of establishment as a unit of the University of Montenegro. Consequently, a special organisational unit was established at the University named "***Institute – Centre of Excellence for Research and Innovation***", and the Decision on status change at the University of Montenegro was published in the Official Gazette of Montenegro 35/18 of 29 May 2018.

Once it was established, the Institute took over the equipment purchased through the project funds, and further scientific and innovative activities will be realised following the involvement of all researchers under the auspices of the University of Montenegro.

In addition to this project, in its current Priority Programme, the Government of Montenegro has defined the objective of establishing new centres of excellence that would be the drivers of scientific activity and the core of development and innovation activities in the country in prospective areas for Montenegro.

Through the centres of excellence, the benefits of collaborations at the international level should be used, as well as those between different sectors and research disciplines, which helps to bridge the shortcomings of individual organisations and enables faster integration and knowledge and technology transfer.

Accordingly, on 28 September 2018, the Ministry of Science launched a Call for the Establishment of Centres of Excellence, with a deadline for submitting applications by 29 March 2019. Seven applications have been submitted and once the evaluation process is completed, a three-year agreement will be concluded with the project proponent of the centre / centres that is / are accepted for financing based on the ranking list.

Furthermore, within the third component of the HERIC project, "Establishing a Competitive Research Environment", 8 major grants were awarded and financed for research and development subprojects. The grant programme aimed to integrate scientific and expert potential in Montenegro in order to contribute to the development of a knowledge-based society and create the basis for the formation of future centres of excellence. The idea behind grant allocation was to improve the Montenegrin scientific and technological infrastructure in areas where the scientific and economic potential is the greatest, thereby increasing the quality and relevance of research and development results, as well as cooperation with the economic sector and foreign research institutions.

The projects were supported in the individual amounts ranging between EUR **240,000 and 400,000.** The selection and grant allocation process was implemented through two calls for applications, published in 2013 and 2014.

In total, 8 grants were approved for research and development subprojects, with the financing in the total amount of MEUR 2,6. A brief account on the implemented projects is presented below:

1. **UNIVERSITY OF MONTENEGRO – FACULTY OF ELECTRICAL ENGINEERING, CS-ICT** project: "New ICT trends based on significantly smaller number of data/metrics and their application in multimedia, biomedicine and communications"
   Project manager: Prof. Srđan Stanković
   Grant amount: **EUR 372,000**

CS-ICT: *The concept of this project is to establish a globally renowned laboratory for signal processing (Laboratory for Compressive Sensing and Emerging Technologies), defining advanced methods in signal processing and developing practical applications in cooperation with the partner institutions. This research project enabled this laboratory to become the main research centre in this field in the region, with high global recognisability. www.cs-ict.ac.me*

2. **UNIVERSITY OF DONJA GORICA – FACULTY OF POLYTECHNICS, PRODE** project: "Laboratory for product design, including disciplines such as graphic, fashion and interior design"
   Project manager: Prof. Sanja Ivanović
   Grant amount**: EUR 337,000**

PRODE: *The main idea that lies behind the project is to enhance the performance of Montenegrin economy by creating an environment for technology transfer. Through the project, a product design laboratory was formed as a local and regional centre for creating and developing prototypes for products made from different types of materials. www.prode.me*

3. **UNIVERSITY OF MONTENEGRO – BIOTECHNICAL FACULTY**, **LOVĆEN** project: "Control of invasive and domestic mosquito vectors and pathogens that they can transmit in Montenegro"
   Project manager: Dr. Igor Pajović
   Grant amount: **EUR 390,000**

LOVĆEN: *Monitoring and control of the MV require efficient, appropriate standardised methods, integrated knowledge and awareness among scientists, academics and policymakers, as well as well-trained young scientists. LOVĆEN project aims to promote these values through the exchange of knowledge and methodologies, as well as to improve higher education, enhance national policy, produce innovations and spread related scientific information, all under the umbrella of monitoring mosquito vectors and the diseases they transmit. As a result, two laboratories were fully equipped in this domain through the project, one for vector identification at the Biotechnical Faculty and one for the detection of diseases they transmit at the Institute for Public Health of Montenegro. www.project-lovcen.me*

4. **UNIVERSITY OF MONTENEGRO – MARITIME FACULTY, SUST-MARINA** project: "Application and promotion of the concept of sustainable development at AD Marina Bar"
   Project manager: Prof. Branislav Dragović
   Grant amount: **EUR 240,000**

SUST-MARINA: *In response to the growing need for marina sustainability, this project is proposed to develop approaches and strategies that allow for the better planning and management of sustainable development in the second-ranked marina in Montenegro, AD Marina Bar. The aim of the project is to test the capacities and include the environmental protection standards to implement a certain level of sustainability. The main result achieved during the project implementation was the international certification of AD Marina Bar based on the application and promotion of the concept of sustainable development in the marina (the first "Blue Flag Marina" in Montenegro since 2017, the first marina in Montenegro certified through ISO 9001:2015 and ISO 14001:2015 standards, Gold Anchor Marina, etc.) www.sustmarina.ac.me*

5. **Mediteran University – FACULTY FOR INFORMATION TECHNOLOGIES (FIT), LAMS** project: "Construction of a measuring station for exploring atmospheric discharges on the Lovćen mountain"
   Project manager: Prof. Adis Balota
   Grant amount: **EUR 325,000**

LAMS: *The goal of the project is to construct, develop and maintain a measuring station for exploring atmospheric discharges on the Lovćen mountain. The analyses showed that one year of operation of the measuring station at Lovćen would correspond (in terms data collection) to 50 years of operation of a similar station at Peissenberg tower in Germany, or 10 years of operation of Gaiberg measuring station in Austria or 5 years of operation of the Säntis measuring station in Switzerland. The reason for that lies in the fact that the area of Lovćen annually has over 2500 lightning strikes. The project produced very significant results through a measuring system for monitoring the lightning current parameters, which, along with the central server, is fully automated in real time. The entire system is based on the most modern information, communication and measurement technologies and for now there are no similar systems in the world. www.lams-project.me*

6. **UNIVERSITY OF MONTENEGRO – BIOTECHNICAL FACULTY, KATUN** project: "Valorisation of Montenegrin katun (nomad villages) through sustainable development of agriculture and tourism"
   Grant amount**: EUR 315,000**

KATUN: *The general objective of the project is to provide knowledge bases for sustainability of the mountain agriculture and to enhance its competitiveness, to preserve important part of the cultural heritage of rural areas and boost the agri-tourism at katuns, as specific spots or nuclei for further social-economic development on Montenegrin mountains. During the project, equipment in the Milk Laboratory at the Biotechnical Faculty was improved, as well as the equipment for local cheese production in the partner companies. A GIS database was established with data on material cultural heritage (a database of 193 katuns in Kučka mountain and about 2900 buildings), and key tourism resources were identified (for example, natural*

and cultural heritage), along with the hiking routes and related activities (e.g. recreation and gastro attractions), described on the basis of their attractiveness. www.katun.me

7. **CLINICAL CENTRE OF MONTENEGRO**, **TELEMONT-EKG** project: "Development, validation and application of telemedicine system TELEMONTEKG for quick diagnosis of heart disease in Montenegro"
   Project manager: Prof. Vesna Miranović
   Grant amount: **EUR 315,000**

TELEMONT-EKG: *The main goal of the Project is the development, validation and application of the telemedicine system TELEMONT-EKG for the quick diagnosis of heart diseases in Montenegro. During the project, the prototype was developed, and validation of the system was performed with approximately 400 patients. Furthermore, a spin-off company Humeds was founded, and a product was registered as a medical tool in Montenegro and successfully put into operation. A successful application of TELEMONTEKG in the health system of Montenegro can lead to revolutionary changes in the use of EKG and Holter devices worldwide.*

8. **CLINICAL CENTRE OF MONTENEGRO**, **HLA – MNE** project: "HLA typing and HLA laboratory in Montenegro"
   Project manager: Prof. Marina Ratković

   Grant amount: **EUR 465,000**, including EUR 315,000 from the **Ministry of Science** and EUR 150,000 from the **Ministry of Health** for procurement of equipment for needs of the laboratory.

HLA – MNE: *The project created a modern National Laboratory for HLA typing within the Office for Transfusion of Montenegro, which enabled detection of the system of human leukocyte antigens, i.e. HLA diagnostics, which is widely applied in everyday clinical practice, population genetics and transplantation medicine. The project makes Montenegro a recognisable destination in this field.*

In total, MEUR 6 were invested for development of science and research infrastructure in Montenegro through the HERIC project (Centre of Excellence + grants).

SCIENCE AND TECHNOLOGY PARK OF MONTENEGRO

The Science and Technology Park is an important part of the overall national infrastructure for the development of innovative and technological companies with high growth and development potential and export potential. On the other hand, STP is an important place for direct cooperation and implementation of joint projects of the academic community and the economy as a whole.

This project is implemented by the Ministry of Science on the basis of the ***Feasibility Study for Establishment of the Science and Technology Park (STP) in Montenegro***, adopted by the Government at its session of 29 September 2011, and the ***Strategic Plan for Establishment of the First STP in Montenegro***, adopted by the Government at its session of 27 December 2012.

The Strategic Plan has envisaged STP in Montenegro as a networked structure with a seat in Podgorica and three decentralised units – impulse centres, in Nikšić, Bar and Pljevlja.

In accordance with the Strategic Plan, following the completion of the establishment of the first impulse centre "Tehnopolis" in Nikšić and the commencement of its operation in September 2016, the activities started on the establishment of the central unit of the STP in Podgorica. The STP should encourage cooperation of scientific and academic institutions with the business and financial sector, and should thus, in the most efficient way, generate innovative activities, entrepreneurship and the development of high-value products.

The STP in Podgorica was established with the aim to:

- Integrate scientific and economic capacities;
- Provide conditions for the work and development of incubators, innovative enterprises, and clusters, establishing a strong connection with local and regional business centres;
- Attract companies from abroad in the field of high technologies; and
- Improve research commercialisation and encourage internationalisation.

The STP stimulates and manages the flow of knowledge and technology among universities, research and development institutions, companies and markets; it facilitates the creation and development of innovation-driven companies through incubation and spin-off processes; and provides other value-added services along with high-quality space and capacities.

The STP was accepted as a priority of the current Government of Montenegro in the field of science and innovation and was recognised as one of the most important infrastructure development projects.Through the Agreement on the Founding of the Limited Liability Company "Science and Technology Park of Montenegro – Podgorica" (abbreviated: STP CG LLC, Podgorica), concluded between the Government of Montenegro and the University of Montenegro, which was adopted by the Government on 17 January 2019, an opportunity has arisen for the establishment of a new national infrastructure with the mission of integrating innovative, scientific, entrepreneurial and economic capacities in Montenegro.The founders of the Science and Technology Park of Montenegro are the Government and the University of Montenegro, with a share ratio of 57:43%.

The facility is located in the campus of the University of Montenegro in Podgorica, near the building of the engineering faculties and laboratories and is currently in the stage of rough construction works. So far, EUR 4.3 million have been invested from the capital budget in the construction of the existing facility. Based on the assessments, another EUR 8.3 million will have to be provided to complete the construction of the STP and to equip it.

Currently, the project documents for the facility are being prepared. This task will be completed in mid-2019. If the administrative and tender procedures and the execution of works are implemented in accordance with the plan, the STP building could be completed by the end of 2020.

INNOVATION AND ENTREPRENEURSHIP CENTRE "TEHNOPOLIS" NIKŠIĆ

Based on the ***Strategic Plan for Establishment of the First STP in Montenegro***, in 2014, the activities started to establish the first Innovation and Entrepreneurship Centre, Tehnopolis in Nikšić, as one of the STP impulse centres.

The Innovation and Entrepreneurship Centre "Tehnopolis" LLC, located in Nikšić, aims to improve the development of entrepreneurship in Montenegro, as the basis for the development of new businesses relying on innovative ideas and the use of modern technologies. Through the role of a promoter and founder of micro and small enterprises at the local and regional level, and the formation of numerous and diverse business and other networks of institutions and individuals, Tehnopolis takes an active part in the process of improving the business activities of enterprises and the implementation of various development projects.

By providing continuous support to existing, potential and newly opened businesses and promoting scientific and research results with a view to raise the level of efficiency and effectiveness of business operations in enterprises, the Innovation and Entrepreneurship Centre should contribute to further development of entrepreneurship, as well as to strengthening entrepreneurial awareness in Montenegro, improving the competitiveness of small and medium-sized enterprises, developing business innovation, leading to better integration of science and business, creating high added value jobs, and improving the competitive position of the regional and national entrepreneurial community.

Tehnopolis was officially opened on 17 September 2016, which created the conditions for providing greater support to entrepreneurs, companies, innovators and scientists and which completed the infrastructure required for the core business.

Through available models of support – pre-incubation, incubation, virtual incubation and lease, Tehnopolis has about 25 tenants in its business incubator. The facility has a modern and functional gross area of approximately 2,000 square meters, which includes the space for accommodation of tenants, micro, small and medium-sized enterprises, as well as the part for development of new companies, laboratories and meeting rooms.

Within the spatial capacities of the Innovation and Entrepreneurship Centre "Tehnopolis", space has been provided for the functioning of three laboratories:

- Industrial Design Laboratory;
- Biochemical Research Laboratory; and
- Data Centre.

The implementation of the service contract has commenced, through which a technical specification for procurement of equipment for these three Laboratories will be prepared through the IPA financial support instrument. Preparation of the technical specification and training of employees will be implemented in 2019.

The Industrial Design Laboratory will be equipped with modern and versatile laboratory and computer equipment and appropriate CAD / CAE / CAM software to implement its role. The usual equipment in laboratories of this type includes powerful 3D printers and scanners used for rapid development of prototypes and reversible engineering, CNC machine tools, as well as equipment for different types of prototype testing of new products, existing elements and structures.

With a view to establishing the ***Biochemical Research Laboratory***, a feasibility study was prepared, providing a description of possible commercial services and an overview of two scenarios with the proposed list of equipment and the analysis of the organisational, personnel and financial aspects of the operational functioning of the laboratory:

Scenario 1: Laboratory for milk and dairy products control. In the first scenario, a fully equipped laboratory for milk and dairy products control would create the possibility of rapid microbiological analyses, analysis of milk chemical components and of the number of somatic cells and bacteria. Equipped with NIR analyser for animal feed, it would provide good infrastructure and prompt feedback for farmers.

Scenario 2: Laboratory for soil control. In the second scenario, the activity of the soil fertility testing laboratory would include the analysis of soil samples against the basic parameters of fertility. The basic parameters of soil fertility are parameters that determine the necessary quantities of basic nutrients for high and high-quality plant production with the appropriate economic effect and improvement or preservation of soil fertility.

The selection of the scenarios is based on the results of the conducted survey that showed the need for biochemical laboratories in the production, processing and market placement of milk, fruits and vegetables production, processing and trade and cereals production and processing. In addition, a survey conducted in order to prepare the needs analysis pointed to the necessity of establishing a strong link between the biochemical laboratory and the universities in Montenegro, which clearly acknowledged the importance of the scientific research component in the overall activity of the laboratory. This primarily refers to higher education institutions recognised as research and educational institutions and expert assistance in the field of agriculture and rural development.

INTERNATIONAL PROJECTS OF RELEVANCE FOR NATIONAL RESEARCH INFRASTRUCTURE

PROJECTS RELEVANT FOR RESEARCH INFRASTRUCTURE IN THE EU FRAMEWORK PROGRAMME

Montenegro joined the **Seventh Framework Programme (FP7)** by signing a Memorandum of Understanding on 25 January 2008. Several projects approved within the FP7 were of great importance in the context of developing the national research infrastructure.

FOREMONT: Fostering innovation-based research for e-Montenegro

Programme: FP7-REGPOT, Coordination and support actions
Beneficiary from Montenegro: Faculty of Electrical Engineering (ETF) – University of Montenegro

Budget: MEUR 1,4

Project duration: 2008-2013

Partners: Centre for TeleInFrastruktur (Aalborg University), CEA-Leti from Grenoble, Ericsson Nikola Tesla Zagreb, Jožef Štefan Institute and iMINDs

Summary: The project aims at strengthening the development of the Faculty of Electrical Engineering through development of research infrastructure, human resources and long-term partnerships, with a special focus on strengthening the research performance of the University in ICT and related applications.

Contribution to research infrastructure: Established ICT Research Centre at ETF

AGRISCIMONT: Fostering a science-based development of sustainable Montenegrin agriculture)

Program: FP7-REGPOT, Coordination and support actions

Beneficiary from Montenegro: Biotechnical Faculty (BTF) – University of Montenegro

Budget: MEUR 1,2

Project duration: 2010-2016

Partners: University of Ljubljana, Swedish Biodiversity Centre, University of Natural Resources and Applied Life Sciences, University of Hohenheim in Germany, Wageningen University in the Netherlands.

Summary: The goal of the project is to strengthen the BTF's excellence by encouraging technological development, human resources and partnerships, as well as through the reorganisation of three interdisciplinary areas (food safety, conservation of agricultural biodiversity and agri-analysis).

Contribution to research infrastructure:
- 7 existing laboratories improved through procurement of equipment (forestry, livestock, veterinary, wine, milk, plant protection and seed testing); and
- 2 new laboratories established (Laboratory for the analysis of plant molecular genetics and Laboratory for the analysis of animal molecular genetics).

HP-SEE: High-Performance Computing Infrastructure for South East Europe's Research Communities

Program: FP7-INFRASTRUCTURES, Coordination and support actions

Beneficiary from Montenegro: Information System Centre (CIS) – University of Montenegro

Budget: MEUR 3,9

Project duration: 2010-2013

Partners: From South East Europe countries

Summary: The goal of the project is to link the existing and upcoming HPC facilities in the SEE region into a common infrastructure, as well as to provide organisational and operational solutions/models for it.

Contribution to research infrastructure: Establishing virtual research infrastructure; establishing GÉANT link for Caucasus

SEE-GRID-SCI: eInfrastructure for regional eScience

Program: FP7-INFRASTRUCTURES, Coordination and support actions

Beneficiary from Montenegro: Hydrometeorological Office of Montenegro; University of Montenegro

Budget: MEUR 3,2

Project duration: 2008-2010

Partners: From South East Europe countries

Summary: The goal of the project is to establish a network that provides processing and storage services for eScience, which is also the contribution of the project to the context of research infrastructure.

Montenegro joined the **EU Framework Programme for Research and Innovation Horizon 2020** by signing the treaty in 2014. Montenegrin scientific research teams have so far not been able to participate in H2020 projects that would imply the improvement / establishment of research infrastructure.

The first opportunity to withdraw funds for research infrastructure in the amount of EUR 3 million will be the "Design Studies" call within the framework of the H2020 European Research Infrastructure programme, which will be published in July 2019. The project application will refer to the development of the Design Study for the SEEIIST regional project. In addition, the programme promotion needs to be further improved, so that research infrastructure would be potentially supported through project proposals by the end of its implementation, at least to some extent.

TECHNICAL COOPERATION PROGRAMME OF THE INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA)[30]

IAEA was set up as the world's "Atoms for Peace" organisation in 1957. It has six departments: Department of Nuclear Energy, Department of Nuclear Sciences and Applications, Department of Nuclear Safety and Security, Department of Technical Cooperation, Department of Safeguards and Department of Management. The activities of the Agency are carried out, above all, through a number of programmes dedicated to various aspects of the use of atomic energy for peaceful purposes.
In June 2006, after regaining independence, Montenegro renewed its full membership in the UN, becoming the 192nd member. In late October the same year, Montenegro became a full member of the IAEA. The most significant and most intensive form of cooperation between Montenegro and the IAEA (given that Montenegro is a non-nuclear country and, according to its Constitution, an ecological state) are technical cooperation programmes. These programmes are implemented in two/three-year cycles, through the implementation of national and regional / interregional projects.
In the context of research infrastructure, technical cooperation programmes are particularly important in terms of the possibility of acquiring smaller and larger scientific research equipment, its repair or replacement of certain parts, as well as the accompanying expert support and training of personnel. Based on the interest expressed by the institutions, Montenegro participates in projects related to medicine, biotechnology, agriculture, environment, veterinary medicine, and cultural heritage.
The second Country Programme Framework for cooperation between Montenegro and the IAEA for the period of 2014-2020 was on 29 October 2014. Following consultations at the national level, and consultations with the IAEA, the programme has identified the following priority areas for cooperation:

- Nuclear Sciences and Applications;
- Sustainable Development and the Environment;
- Health;
- Radiation Protection, Nuclear Safety and Security; and
- Human Resource Development.

30 https://www.iaea.org/

As part of the Technical Cooperation Programme Cycle of 2014-2015, the national project "Radon Mapping in Montenegro" was approved. The project had a dominantly research character, and the equipment acquired included: alpha radon monitors, charcoal radon monitors, radon detectors, dosimeters and software.
As part of the Technical Cooperation Programme Cycle of 2016-2017, two national projects relevant for the research infrastructure were implemented, as follows:

- "Improving Diagnosis of Animal Diseases and Food Pathogens" with procurement of the following research equipment: thermocycler, freezer, tissue processor, TissueLyser, centrifuge, and some smaller equipment.
- "Strengthening Regulatory Infrastructure for Radiation Safety and Nuclear Security" with the procurement of equipment.

As for the next Technical Cooperation Programme Cycle (2018-2019), Montenegro has nominated two projects, as follows:

- Improving Paediatric Diagnostic in Computed Tomography Examinations, where the delivery of the state-of-the-art CT device is expected for needs of the Institute of Child Health; and
- Strengthening Technical and Institutional Capacities of the National Reference Laboratory for Food and Feed Control.

Overall, since 2007, Montenegro has received more than MEUR 4 through technical cooperation with the IAEA.
As for the next cycle (2020-2021), Montenegro has nominated two national projects, which are still evaluated, as well as one regional project, related to support for the "Human Resources Development" component within the SEEIIST project, worth a total of EUR 0.5 million.

I.6 Regional infrastructure potential – SEEIIST project[31]

Smart specialisation requires specific stimulation policies, investments and projects, including the projects based on large research infrastructures. In this context, Montenegro is recognised as the initiator of establishment of the South East European International Institute for Sustainable Technologies – SEEIIST. The initiative was formalised as a regional project with the signing of a Declaration of Intent by eight (8) Signatory Parties from the SEE region on 25 October 2017 at a Ministerial meeting at CERN, Geneva.

Following an analysis of the common regional social and economic challenges and the need for high technologies, a state-of-the-art 'Facility for Tumour Therapy and Biomedical Research with Protons and Heavier Ions' was selected as the option for the SEEIIST Project. The technology underpinning the Institute is the new generation of medical accelerators, offering tumour treatment with heavy ions, which is the most modern and the most powerful method of treating many types of cancer, given that the radiation dose is deposited solely in the tumour region, thus protecting the normal cells. The therapy is unique because of the possibility to

31 http://seeiist.eu

treat radio-resistant tumours. The method is still in the pioneering phase and requires further, broad-spectrum extensive research. It is therefore planned to dedicate 50% of the beam time to research, which would make the SEEIIST project unique in the world and important for Europe as a whole.

The establishment of the Institute will offer numerous opportunities for technology transfer to the South East European states. In particular, this will be a great benefit for the local industry, since the procurement and construction of certain technological components for the facility can be assigned to local industry. Moreover, the project will give rise to spin-offs and trigger complementary technologies, like boosting the development of green technologies. On top of that, the Institute will also enhance the creation of a powerful digital network, digital system of collecting, processing and transferring medical and scientific, as well as cyber security.

The Concept Study found that, in order to achieve the clinical and scientific goals, a clinical network and a scientific network should be established at the very beginning of the project implementation. In this respect, capacity building is a key segment of the project in the first phase of implementation, and the first support in this regard has come from the IAEA, which has shown openness for cooperation since the very beginning of the project implementation.
The SEEIIST project is now entering the Design Study Phase, thanks to the first financial support by the Directorate General for Research and Innovation of the European Commission (DG RTD). Two renowned international research centres, CERN in Geneva and GSI-FAIR in Darmstadt, are providing generous support as hosts of the SEEIIST Design Study Phase. With the support of these institutions, the SEEIIST Project is now in the best hands, with great potential for success.

The overall value of the project is EUR 200 million. This is how SEEIIST could enable competitiveness in relation to the rest of Europe, whose scientists, engineers and physicians could also benefit from access to such an infrastructure. Because of its potentially invaluable importance for the SEE region, the project has the potential to be integrated into the European plans for the development of the region and regional cooperation.

II ACCESS TO RESEARCH INFRASTRUCTURE

II.1 Open access to research infrastructure

As already mentioned above, research infrastructure has the ability to assemble a critical mass of researchers in a given scientific field, as well as to attract excellent researchers from the international research community, along with the members of the business and the civil sector. In doing so, it attracts new knowledge and investment, playing an important role in linking all the segments of society and stimulating international scientific cooperation. In such a context, open access to research infrastructure, which forms part of a wider open-source policy in science and innovation, constitutes a key element in improving research and innovation development, as well as in networking with potential users.

According to the European Charter for Access to Research Infrastructures[32], Access refers to the legitimate and authorised physical, remote and virtual admission to, interactions with and use of Research Infrastructures and to services offered by Research Infrastructures to Users. Such Access can be granted, among others, to machine time, computing resources, software, data, data-communication services, trust and authentication services, sample preparation, archives, collections, the set-up, execution and dismantling of experiments, education and training, expert support and analytical services.

The Charter provides for three types of access:

- Excellence-driven, which is exclusively dependent on the scientific excellence, originality, quality and technical and ethical feasibility of an application evaluated through peer review conducted by internal or external experts. It enables users to get access to the best facilities and encourages collaborative research and technological development.
- Market-driven, which applies when Access is defined through an agreement between the User and the Research Infrastructure that will lead to a fee for the Access and that may remain confidential.
- Wide Access, which guarantees the broadest possible Access to scientific data and digital services provided by the Research Infrastructure to Users wherever they are based. Research Infrastructures adopting this mode maximise availability and visibility of the data and services provided.

Opening research infrastructure is a rather complex process, which implies the establishment of an access policy, the definition of contributions that the user can provide, the establishment of the costs, data management, respect for ethical rules, the preparation of user instructions,

32 https://ec.europa.eu/research/infrastructures/pdf/2016_charterforaccessto-ris.pdf

as well as the guarantee of transparency, non-discrimination on any basis, and finally health and safety when using the infrastructure. Furthermore, open access implies the existence of an online platform providing an overview of available infrastructure and all related information, which allows for adequate planning of access to it.

Open access to research infrastructures, i.e. the regulation of open access and the inclusion of this segment as one of the criteria for the selection of key projects, is a relatively new concept at the EU level, as well as an absolute novelty at the national level, requiring additional promotion. During the mapping process, the institutions were asked whether they were interested in an open access and what kind of services would they offer to potential users. It is encouraging that all institutions with a larger research infrastructure positively responded to the question of open access, indicating education and training and various types of measurement and testing in the offer segment. On the other hand, when it comes to interest in accessing national research infrastructure, the public did not show much interest, which is mainly a consequence of the lack of transparency of the available national research infrastructure, poor visibility of the services that some national infrastructures can offer, as well as of the poor orientation of the economic sector to the science-based development. Therefore, in the coming period, efforts should be made to strengthen the visibility of national infrastructures in order to be transparent to potential users. This way, the potential users would begin to apply for access and awareness of interested institutions about open access would be raised, making them ready to organise the procedures and to draw benefits from such an access to infrastructure.

II.2 Access to national and regional research infrastructures

Opening access to national and regional research infrastructures can be useful in many ways, both for service providers and for users (researchers, business people, civil sector, etc.).
First and foremost, this approach avoids duplication of equipment, which enables research infrastructures to expand the range of research activities by implementing a certain part of the research process through the use of available equipment of another research infrastructure, using the savings to purchase some other, missing equipment.
Service users from the economic and civil sector can use this approach to test their products and innovative ideas in laboratory conditions subject to a certain fee, but they can also use databases of research infrastructures, as well as broader databases with which they are connected, to which they would otherwise have no access.
The access also opens up many cooperation possibilities, because as soon as a research infrastructure becomes open and shows the spectrum of the services it offers, it becomes more visible to the broader community and the possibilities arise for assessing the competitive advantages and complementarity with other infrastructures.
This approach also opens up a better chance of fostering interdisciplinarity, international and intersectoral mobility, as well as better use of the EU and other available funds, primarily thanks to the integration of different actors around common priorities.
In order for a research infrastructure to be attractive to potential users, it must be competitive, i.e. it has to offer something that other infrastructures do not offer. Given that the region of the Western Balkans has entered the phase of re-strengthening technological development recently, it is not realistic to expect a great interest of users from the international community, which is why the focus should be on using the competitive advantages of the national infrastructures and infrastructures available in the region.
Of the total number of general public respondents, only 38% are interested in accessing the

national research infrastructure, while 35% are interested in accessing the regional research infrastructure. The national infrastructures included the NGS Platform of the Institute of Public Health of Montenegro, equipment of the Centre for Ecotoxicological Research (CETI), Administration for Food Safety, Veterinary and Phytosanitary Affairs, equipment of the BIO-ICT Centre of Excellence, with several respondents who indicated the importance of access to databases of national infrastructures. On the other hand, with regard to regional infrastructures, the respondents have mainly opted for access to equipment at university units.
In terms of the institutions, almost half of them declared themselves interested in accessing some of the regional infrastructures. These regional infrastructures are active in the following areas: plant protection and environmental protection, electronic microscopy, experimental medicine, molecular genetics, engineering in the field of seismology, food technology, biological research, oceanography and fisheries and public health.
During the public consultations, a number of national and regional examples have been indicated where access is informally already made available, although mainly in relation to the provision of training services and certain measurements. This mostly refers to partner institution access. Also, due to an increase in investments in scientific research equipment after 2015, several national infrastructures can offer competitive services to the Region, which is why it would be particularly important to make information on research infrastructure available at the regional level.

Example No. 1 – Research infrastructures competitive in the WB region – analyses

Name of research infrastructure: X-ray fluorescence spectroscopy (Epsilon 4 – PANalytical) and X-ray diffraction (Empyrean - Malvern PANalytical)

Institution: Agency for Medicines and Medical Devices

Description: X-ray fluorescence is based on the measurement of X-rays emitted by sample atoms after excitation by external sources of radiation. X-ray fluorescence is a non-invasive technique suitable for the analysis of liquid, solid and powder materials. It is used for qualitative and quantitative analysis of materials, which implies impurity analysis in accordance with the valid ICH guidelines (ICH Q3D – elemental impurities).

X-Ray diffraction is another non-invasive analytical method for determining the chemical composition and crystallographic characteristics of the tested samples. It is based on an X-ray analysis and diffraction.

Services that could be offered: Commercial service of analyses in the following areas: pharmaceutical analysis of medicines, analytical expertise in case of suspected counterfeit medicines, forensics, food industry, quality control for items of general use.

Why is it unique in the region?

A non-routine top-performance technique that is unique in the region and allows for very rapid analytical testing of the samples. In addition to analysing a wide range of diverse samples, the greatest advantage is that it is suitable for the analysis of counterfeit and false medicines that are a growing problem in the world.

Open access option?

Acceptable, subject to certain restrictions depending on the Agency's obligations and with compliance with the regulations that are in line with the Agency's quality system.

Example No. 2 - Research infrastructures competitive at the regional level – education and training

Name of research infrastructure: "OSC OFF – SHORE" simulator

Institution: Faculty of Maritime Studies, University of Montenegro

Description: Procurement of equipment worth a total of EUR 1.5 million was implemented within the joint project of the University of Montenegro – Faculty of Maritime Studies and Aalesund University from Norway. OSC OFF - SHORE simulator is currently the most modern device of its kind and the most expensive of all at the Faculty with a value of EUR 900,000.00. It is used for simulation of the "offshore" operations related to the supply of oil platforms. Within the cooperation framework, the following devices were also acquired: he Rolls Royce Dynamic Positioning Simulator, the Transas Navigation Simulator and the Transas 3D touch screen shipboard console.

Services offered: Educating students and training seafarers for special operations on oil platforms, i.e. ships that deliver different equipment for them.

II.3 Internationalisation and potential for access to large European infrastructure

II.3.1. Internationalisation

Internationalisation, which implies enabling access to international knowledge centres and large research infrastructures, as well as the networking with renowned research teams, constitutes a key segment of research and innovation policy. Montenegro has already been recognised for its highly developed international cooperation, but since December 2016, the focus has been placed on opening access to large European research infrastructures. Benefits of using competitive equipment, laboratories and infrastructure for Montenegrin researchers are numerous:

- Capacity building and strengthening, given that trainings and work with mentors and research groups in international infrastructures gives them the opportunity to transfer acquired knowledge to their home country and train other members of their research group;
- Implementation of a certain phase of the research process, which is not possible in the country due to the lack of adequate equipment;
- Strengthening scientific excellence through cooperation with renowned research teams (participation in joint projects, joining current initiatives, etc.); and
- Perspectives for young researchers – fellowships for doctoral and postdoctoral students, participation in conferences, workshops, and the possibility of a dual doctorate as a special benefit, enabling our doctoral students to spend some time in international institutions under their fellowships.

Most international infrastructures function in line with the principle of open access, which means that, in addition to researchers, representatives of the economic and civil sector from Montenegro can also take advantage of the numerous opportunities offered.

EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH (CERN)[33]

Cooperation with **CERN** is carried out on the basis of the Agreement between the Government of Montenegro and CERN on scientific and technical cooperation in the field of high energy physics, signed on 1 October 2007. This Agreement has enabled various forms of professional development in CERN for physics professors, as well as for students. However, it was only ten years later that Montenegro joined one of CERN's projects for the first time, concluding a Memorandum of Understanding for Maintenance and Functioning of the CMS Detector, on 7 July 2017. **In this way, Montenegro has become a full member of the CMS experiment, one of the largest LHC experiments**. In this experiment, a research team from Montenegro, from the University of Montenegro – Faculty of Natural Sciences and Mathematics and the Faculty of Electrical Engineering is taking part. A Montenegrin research group also participates in the CMS "Phase 2 Upgrade". In 2018, 7 young researchers from Montenegro visited CERN.

EUROPEAN MOLECULAR BIOLOGY ORGANIZATION (EMBO) / EUROPEAN MOLECULAR BIOLOGY LABORATORY (EMBL)[34]

Montenegro became a full member of **EMBO** and joined **EMBL** in 2017. In this regard, the Parliament of Montenegro passed the Law on the Ratification of the Agreement on the Establishment of EMBO and EMBL on 27 April 2018. This way, Montenegrin doctoral students in biological, medical and biotechnical sciences have the opportunity to get familiar with the laboratories of this prestigious organisation, as well as with the possibilities for their further training. Also, within this collaboration, Montenegrin researchers are offered fellowships for work and stay in prestigious laboratories in EMBO member states. Through the call for co-financing scientific research and innovation activities, the stay of seven young researchers in EMBL was financed in 2018.

EUROPEAN SOCIAL SURVEY – EUROPEAN RESEARCH INFRASTRUCTURE CONSORTIUM (ESS ERIC)[35]

Montenegro pays special attention to social sciences and humanities and has joined, on 1 October 2018, the Round 9 of the European Social Survey. **ESS ERIC** is the largest international comparative research of social phenomena in Europe, as well as a data infrastructure that exists since 2002, becoming a pan-European infrastructure since November 2013 (Commission Implementing Decision 2013/700/EU).
This is theoretically and methodologically most comprehensive international research in the field of social sciences in Europe at present. It implies gathering data on attitudes, values and beliefs of citizens of Europe on a number of important topics, including democracy and citizen participation, relation to family, marriage, work, migration and social inequalities, as well as to important and current issues such as climate change or economic crisis. The survey was designed to collect academic, scientifically-rigorous and comparable data meeting high methodological standards, which would help decision-makers to measure and monitor these changes, making evidence-based plans and decisions. The data provided by the ESS are open and accessible to the entire academic community, decision-makers, journalists, civil society and the general community.

33 https://home.cern/science/experiments/cms

34 https://www.embl.de/

35 https://www.europeansocialsurvey.org; https://www.facebook.com/ESSMNE/; http://www.mna.gov.me/vijesti/197789/Odrzana-radionica-Evropskog-drustvenog-istrazivanja-ESS-u-Tivtu.html

By joining European Social Survey, Montenegrin researchers will have a number of benefits. First of all, they will be able to use quality data for studying social changes and phenomena throughout Europe and in Montenegro. Work on data collection and data work will be an excellent training for young researchers and will serve as a good basis for master and doctoral theses. Researchers in Montenegro will connect with the most active research teams in the field of social sciences in Europe. Finally, Montenegro will be included in the research map of the world and European scientific community that will know more about the country and be able to use standardised Montenegrin data. All this should further encourage the development of research culture in Montenegro in social sciences. A research team has been set up, as well as an advisory board composed of prominent representatives of science, media, civil society and government and parliamentary bodies responsible for research.

Representative of Montenegro at the ESS ERIC General Assembly is Prof. Ilija Vujačić from the University of Donja Gorica.

The national coordinator is Prof. Olivera Komar from the Faculty of Political Science, University of Montenegro.

INTERNATIONAL CENTRE FOR GENETIC ENGINEERING AND BIOTECHNOLOGY (ICGEB)[36]

Cooperation of Montenegro with the **International Centre for Genetic Engineering and Biotechnology (ICGEB)** has been implemented continuously ever since the entry into force of the Decision on Accession on 5 September 2012. Accession to this research infrastructure has opened up the possibilities of: fellowships for doctoral and postdoctoral studies and SMART fellowships for mobility; funding of research grants within the Collaborative Research Program CRP-ICGEB; and funding the organisation and participation in scientific meetings, workshops and courses in the field of natural sciences.

EUROPEAN SPACE AGENCY (ESA)[37]

Montenegro has taken the first steps towards establishing cooperation with the ESA in 2018. The ESA is an international organisation with 22 member states, whose main mission is to shape capacity building in this area in Europe and to enable the citizens of Europe and the world to benefit from investing in space research. The possibilities arising from this cooperation are related to: involvement of Montenegrin researchers in ESA projects in various fields, from the field of meteorology and environmental protection to satellite navigation and robotics. Also, the ESA collects a large number of data essential for the field of meteorology, telecommunications, etc. on a daily basis, and can therefore be of great benefit to Montenegro. We are currently working on finding the way to integrate the relevant ideas of Montenegrin scientists into this prominent scientific-technological organisation.

36 https://www.icgeb.org/

37 https://www.esa.int/ESA; http://www.mna.gov.me/vijesti/183573/Prva-zvanicna-posjeta-delegacije-Evropske-svemirske-agencije-Crnoj-Gori-sirok-spektar-prednosti-saradnje.html; http://www.mna.gov.me/vijesti/194704/Delegacija-iz-Crne-Gore-ucestvovala-u-radu-konferencije-Evropske-svemirske-agencije.html

Example of a successful practice arising from integration with ESA

In April 2018, an ESA workshop was held in Podgorica with a view to familiarising Montenegrin scientific research community with this organisation and to exchange ideas on potential joint projects. On that occasion, the ESA presented one of its largest projects, GALILEO, which will, in comparison with existing satellite navigation systems, introduce a wide range of novelties in various fields (geodesy, meteorology, agriculture, navigation, etc.). The system will become operational as of 2020.

In order to receive signals from GALILEO, it is necessary to establish a modern network of GNSS permanent stations, which is the goal of one of the innovative projects approved through the Grant Programme 2018-2020 titled **"Joining the EUREF permanent network with multiple GNSS CORS stations in Montenegro – MontePN".**

The grant holder is the Faculty of Information Systems and Technologies - University of Donja Gorica, and the project manager is Prof. Biljana Stamatović.

The total project value is EUR **85,250,** while the grant of the Ministry of Science amounts to EUR **59,675**.

Key project activities are related to the establishment of infrastructure and the procurement of MontePN system equipment, joining the EUREF permanent GNSS network (EPN), the analysis of the GALILEO system performance and its application in commercial projects and the establishment of a spin-off company.

EUROPEAN INSTITUTE OF INNOVATION AND TECHNOLOGY (EIT)[38]

Montenegro is interested in joining the European Institute of Innovation and Technology (EIT). The EIT is an EU body established in 2008 with the aim of strengthening the EU's capacity for innovation. It is an integral part of the H2020 programme and provides education and training to a new generation of entrepreneurs, enabling the development of innovative products and services and supporting start-ups. The EIT operates under a principle of communities made up of partnerships of businesses, research institutions and universities, with a focus on addressing various social challenges (EIT Climate, EIT Digital, EIT Food, EIT Health, EIT Energy, EIT Manufacture, EIT Raw materials and EIT Urban mobility). The activities supported relate to education and training programmes, business incubator and accelerator programmes and innovation-based research projects. When it comes to previous activities of Montenegro in the EIT, in 2018, two beneficiaries – young professionals participated in skill-development summer school programmes), while the Faculty of Metallurgy and Technology – University of Montenegro and the Geological Institute are to take part in an EIT project (RawMaterials), whose implementation starts in 2019.

II.3.2. Potential for access to large research infrastructure

During the research infrastructure mapping process, the Ministry of Science used the questionnaire for the institutions and the questionnaire for the interested public to examine the need of researchers and the public for access to some of the large research infrastructures in Europe, all with a view to consider the possibility to enable access to and the use of these infrastructures in the future through subscriptions and active membership / partnership. Most

38 https://eit.europa.eu

institutions have indicated their interest in accessing large infrastructures, while 65% of public respondents confirmed the same.

The list included a number of infrastructures, but a slightly higher concentration of researchers was identified with the following infrastructures:

- In the field of social sciences and humanities: CESSDA ERIC (Consortium of European Social Science Data Archives – operational since 2013), CLARIN ERIC (Common Language Resources and Technology Infrastructure – operational since 2012) and DARIAH ERIC (Digital Research Infrastructure for the Arts and Humanities – operational since 2019).
- Euro-BioImaging (European Research Infrastructure for Imaging Technologies in Biological and Biomedical Sciences, operational since 2016).
- Danubius-RI (International Centre for Advanced Studies on River-Sea Systems, to become operational in 2022).
- EU-IBISBA (Industrial Biotechnology Innovation and Synthetic Biology Accelerator, to become operational in 2025).
- MIRRI (Microbial Resource Research Infrastructure – to become operational in 2021).
- DISsCO (Distributed System of Scientific Collections – to become operational in 2025).

The results of the questionnaires have indicated the following:

- Research infrastructures in the field of social sciences and humanities are recognised by the interested public, which confirms the justification of accession to ESS-ERIC, but also opens up the ground for further consultation and attraction of a larger number of potential users in order to consider accessing some of the identified pan-European infrastructures in this area.
- It is evident that most pan-European infrastructures marked as preferential will be operational during the next strategic period (2021-2026), which will be of particular importance when passing the next Roadmap.
- There is a need for targeted promotion of ESS-ERIC and EMBL collaborations, since some respondents were not informed that Montenegro had already accessed these infrastructures.
- A large percentage of respondents see the potential for European-level cooperation in terms of access to research infrastructures in collaborations at the institutional level – with prominent scientific research institutions / universities of the EU Member States.

III LIST OF PRIORITY ACTIVITIES

Based on the 2019 research infrastructure mapping, the analysis of the national system state of play, numerous initiatives at the international level, and the expressed attitudes of scientific research institutions and interested public, the priority activities in the period of 2019-2020 will relate to:

- Providing an online and transparent access to the overview of available national scientific research equipment – improving the "Scientific Network" system (2019-2020);
- Considering the options for using international databases of research infrastructure and potential accession (2019);
- Financial support to the national research infrastructure by providing that 50% of the grant of the Ministry of Science can be planned for the purpose of procurement of equipment (2019-2020);
- Support to research infrastructure in S3 priority areas (2019-2020);
- Establishment of Science and Technology Park (2019-2020);
- Establishment of laboratories in Innovation and Entrepreneurship Centre Tehnopolis in Nikšić (2019-2020);
- Awareness raising and capacity building for open access (2019-2020);
- Continuation of consultations for enabling access to large European research infrastructure (2019-2020);
- Further strengthening of internationalisation activities (2019-2020);
- Promotion of opportunities within the EU Framework Programme H2020 (2019-2020).